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Datasheet for the decision of 20 January 2022

Case Number:	T 0685/17 - 3.4.01
Application Number:	10775762.7
Publication Number:	2494192
IPC:	F03D7/04, F03D11/00, G01P5/00, G01P13/02
Language of the proceedings:	EN

Title of invention:
Wind sensor system using blade signals

Patent Proprietor:
SSB Wind Systems GmbH & Co. KG

Opponent:
ENERCON GmbH

Headword:
Wind sensor System / SSB WIND SYSTEMS

Relevant legal provisions:
EPC Art. 56
RPBA Art. 12(4)

Keyword:

Inventive step - (yes)

Late-filed evidence - submitted with the statement of grounds of appeal

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Case Number: T 0685/17 - 3.4.01

D E C I S I O N
of Technical Board of Appeal 3.4.01
of 20 January 2022

Appellant: (Opponent)	ENERCON GmbH Dreekamp 5 26605 Aurich (DE)
Representative:	Rossmanith, Manfred Bräutigamsweg 5 30974 Wennigsen (DE)
Respondent: (Patent Proprietor)	SSB Wind Systems GmbH & Co. KG Neuenkirchener Strasse 13 48499 Salzbergen (DE)
Representative:	Bossmeyer, Jörg Peter Wassermannstrasse 25 49074 Osnabrück (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 18 January 2017 rejecting the opposition filed against European patent No. 2494192 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	P. Scriven
Members:	B. Noll
	D. Rogers

Summary of Facts and Submissions

I. The opponent appealed the Opposition Division's decision to reject the opposition.

II. The opposition was based on the grounds of lack of novelty and inventive step (Article 100(a) EPC) and added subject-matter (Article 100(c) EPC).

III. In the statement of grounds of appeal, the opponent argued that claim 1 of the patent did not involve an inventive step having regard to

E1: Erich Hau: Windkraftanlagen. Springer, 1996, ISBN 3-540-57430-1, pages 133-185;
E3: EP 1 454 058 B1.

IV. With the statement of grounds, the opponent also submitted a further document

E5: WO 2008/041066 A1,

and argued that it was known from E5 to use a lookup table storing parameters of the mechanical load in response to wind parameters, for inferring wind characteristics.

V. With its response to the appeal, the proprietor rejected that the appeal be dismissed, and submitted two auxiliary requests.

VI. In a communication sent with a summons to oral proceedings, the Board gave a preliminary opinion on the case.

VII. At oral proceedings, the opponent requested that the appealed decision be set aside and the patent revoked.

VIII. The respondant proprietor's requests were that the appeal be dismissed, or alternatively, that the patent be maintained on the basis of a new auxiliary request 1, filed during the oral proceedings. The previous auxiliary requests were withdrawn.

IX. Claim 1 of the patent reads (reference signs omitted):

A wind-velocity-field measurement system for use in a wind turbine having a rotor with two or more blades, comprising:

- at least one sensor-signal obtained by measuring a physical quantity on at least one of the blades, the physical quantity being indicative of at least one wind-velocity-field characteristic;

- a table built for a plurality of wind conditions by associating values characterizing cyclic and constant components of the at least one sensor-signal with values of the at least one wind-velocity-field characteristic, and;

- searching means for determining from the

table a value of the at least one wind-velocity-field characteristic for a current wind condition given values characterizing cyclic and constant components of the at least one sensor-signal.

X. The claims of the auxiliary reqeusts are not relevant to the decision, and are omitted.

XI. The parties' submissions, insofar they are relevant for the decision, are discussed in the reasons, below.

Reasons for the Decision

Background

1. During the operation of a wind turbine, its rotor blades are exposed to variations of their mechanical loads. To a certain degree, the variation in load can be reduced by adjusting the pitch angle of individual blades while the rotor is turning. However, effective control of the pitch angle requires knowledge of the instantaneous wind conditions across the area swept out by a rotor blade during a revolution of the rotor. The invention aims at gaining information on the wind conditions within this area and making it available in a form suitable for control of blade pitch.

Claim 1, inventive step

2. E3 discloses a measuring system for a wind turbine, in which the proper functioning of a sensor for measuring wind speed is monitored. The measuring system derives an instantaneous estimate of the wind speed from an operating variable of the wind turbine. At relatively high wind speeds, the operating variable under consideration is the blade pitch angle; as shown in the Figure 2b of E3, the blade pitch angle decreases with increasing wind speed and there is a clear functional relationship between the pitch angle of the rotor blade and the wind speed.

3. In terms of claim 1 of the patent, E3 discloses a measurement system for measuring the velocity of wind driving the turbine. The system comprises a sensor signal, namely the blade pitch angle, which is a physical parameter of the blades and is indicative of the wind speed as shown in figure 2b. The wind speed is a characteristic of the wind velocity field.

4. E3, paragraph 17 describes that the blade pitch angle is used to check the correct functioning of an anemometer. The skilled reader would deduce directly from this, that, in order to check the wind speed detected by the anemometer, it is compared with a wind speed resulting from the detected blade pitch angle. The measurement system of E3, therefore, implicitly has means to determine, for an instantaneous blade pitch angle, the wind speed corresponding to the detected blade pitch angle.

5. The proprietor argued that obtaining a pitch angle by measuring a physical quantity on a blade was not disclosed in E3. The skilled reader would have

understood the pitch angle shown in Figure 2b as being an output of a control unit, but not a a measured parameter. Further, the blade pitch angle was not a physical quantity which was measured on the blade but one which, if measured at all, was measured at the interface between the blade and rotor hub.

6. The Board does not agree. The blade pitch angle in E3 is representative of the "true" wind speed which is compared, as a "trusted" value, with a value obtained from the anemometer. Therefore, the skilled reader would understand that the blade pitch angle in E3 is deliberately obtained from measurements on the blade as a "true" value; and not, as argued by the proprietor, as an output of a control unit. Further, the blade pitch angle defines the orientation of the blade in relation to the rotor hub. It is a parameter inherently linked to the blade itself. The preposition "on", in claim 1 of the patent, is not specific and does not exclude the blade pitch angle.

7. Claim 1 has the further features, not known from E3:

- a table for associating constant and cyclic components of the sensor signal with values of the wind-velocity-field characteristic; and

- searching means for determining from the table a value of the at least one wind velocity field characteristic for a current wind condition given values characterizing cyclic and constant components of the at least one sensor signal.

8. These features define the system in that the physical quantity in question is stored in the table as components having constant and cyclic portions, and

that a relationship between the sensor signal and the wind characteristic is determined on the basis of both these components of the sensor signal. The technical effect is, therefore, to have a measurable physical quantity represented in a form which is useful for estimating wind field characteristics. The technical problem to be solved, starting from E3, is to obtain a representation.

9. The skilled person, further considering E1 in addition to E3, would have inferred, from figure 6.32, a relationship between the impact bending moment of a rotor blade and the wind speed at the rotor hub. The skilled person would, therefore, have considered the impact bending moment for deriving the wind speed at the height of the rotor hub. The skilled person would further have considered storing this correspondence as a table. However, the skilled person would not have considered storing values of the blade bending moment as constant and cyclic components and searching for a characteristic of the wind velocity field on the basis of cyclic and constant components of the sensor signal. A search on cyclic and constant components is not the same as search on instantaneous sensor signals and requires a separate processing of instantaneous sensor values, for example a Fourier transform, to obtain constant and cyclic components. In the Board's view, a search for wind velocity field conditions on the basis of constant and cyclic signal components is not suggested in either E3 or E1.

10. The opponent argued that the skilled person would have inferred, from figure 6.7 of E1, that the impact bending moment varied during each turn of the wind turbine, as a result of a vertical gradient of the wind speed and was, therefore, periodic over time. The

skilled person would, therefore, have taken account of the spectral components of the sensor signal for determining a wind velocity field characteristic.

11. The Board does not agree. Even though Figure 6.7 of E1 shows the temporal characteristic of the impact bending moment of a blade during a single revolution, this does not, on its own, teach the skilled person to detect wind characteristics on the basis of constant and cyclic components of the sensor signal. As the opponent pointed out, signal processing on spectral components was known in certain technical fields such a image or sound processing. However, it would not be without hindsight to apply a signal processing known from image or sound processing in the field of wind turbine control. A consideration of spectral components of a sensor signal for the purpose of determining a parameter required for the control of the wind turbine would not have been obvious to the skilled person in the field of wind turbine control.

12. The subject-matter of claim 1 was, therefore, not rendered obvious to the skilled person by the available prior art. It involves an inventive step.

E5, consideration in the appeal proceedings

13. E5 was submitted with the statement of grounds of appeal.

14. The opponent argued that it had become clear only at the oral proceedings before the Opposition Division that the focus was on the presence of a table and search means. E5 was submitted to show that using a

table and search means were known in the field of control systems for wind turbine.

15. The Board is not persuaded by this argument.

16. In the decision under appeal, it is stated (see reasons, point 9.4) that *[I]n any case, the [Opposition Division] concludes that E1 does not teach the skilled person to combine the two informations of constant and cyclic components into one table*. Thus, the Opposition Division's essential point in their reasoning was the combination of cyclic and constant information, and not merely the use of a table and search means. This view had already been given in the Opposition Division's communication accompanying the summons to oral proceedings, in which it was stated that the sensor signal considered in E3, i.e. the pitch angle, had only a constant but no cyclic component (point 5, last paragraph of that communication), and that figure 6.32 in E1 did not show constant and cyclic components (point 6, last paragraph).

17. Thus, the opponent had reason and opportunity to react to this opinion of the Opposition Division during the first instance proceedings and not only with the appeal and should have submitted E5 in the first instance proceedings, in response to the summons to oral proceedings.

18. Notwithstanding the above, E5 is no more relevant than E1 or E3, as regards the use of constant and cyclic values in a table for searching a wind velocity field parameter based on a sensor signal. The Board, therefore, does not see a convincing and exceptional reasons to consider E5.

19. For these reasons, the Board did not consider E5 in the appeal proceedings (Article 12(4) RPBA 2007).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

D. Meyfarth P. Scriven

Decision electronically authenticated